

ORIGINAL ARTICLE

Taxonomic revision of the genus *Phryganogryllacris* (Orthoptera: Gryllacrididae) from China

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Abstract A taxonomic revision of the genus *Phryganogryllacris* Karny, 1937 is provided. Twelve species of the genus from China are recorded, including 5 species described as new to science, namely *P. sichuanensis* Li, Liu & Li, **sp. nov.**, *P. parva* Li, Liu & Li, **sp. nov.**, *P. truncata* Li, Liu & Li, **sp. nov.**, *P. interrupta* Li, Liu & Li, **sp. nov.** and *P. longicerca* Li, Liu & Li, **sp. nov.** Two new combinations are also reported here, *P. gialai* (Gorochoy, 2004) (Vietnam) **comb. nov.** and *P. alia* (Gorochoy, 2004) (Vietnam) **comb. nov.** A key to Chinese species of the genus was provided.

Key words Gryllacridinae, *Phryganogryllacris*, new species, new combination, China.

1 Introduction

The genus *Phryganogryllacris* was erected by Karny in 1937, with the type species *Gryllacris phryganoides* (De Haan, 1842) and other 18 species all over the world. Liu (1999) provided a key to the genus, including 4 species in China and redescribed 2 species *P. subrectis* and *P. mellii* distributed in Fujian. Gorochoy (2008) described 2 new species and 1 subspecies of this genus. According to Orthoptera Species File Online (Eades *et al.*, 2014), the genus *Phryganogryllacris* includes 26 species and 7 subspecies in the world at present, which are distributed in China, Vietnam, Burma, Cambodia, India, Japan, Philippines and Malesia and so on. Among them, 7 species have been recorded in China from Henan, Guangxi, Zhejiang and so on.

In this paper, a taxonomic revision of the genus *Phryganogryllacris* is provided. Five species are described as new to science here, namely *P. sichuanensis* Li, Liu & Li, **sp. nov.**, *P. parva* Li, Liu & Li, **sp. nov.**, *P. truncata* Li, Liu & Li, **sp. nov.**, *P. interrupta* Li, Liu & Li, **sp. nov.** and *P. longicerca* Li, Liu & Li, **sp. nov.**

Additionally, two species, *Metriogryllacris gialai* Gorochoy, 2004 and *M. alia* Gorochoy, 2004, which are reported from Vietnam by Gorochoy (2004), should be transferred to the genus *Phryganogryllacris*, because their abdominal tergite 9 has movable hook-like processes.

2 Materials and methods

All specimens of the genus were collected by light-trapping and net-catching. Adult specimens were preserved in 70% ethanol in the field, then moved out and dried in the lab. The specimens were observed with the help of a

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Received 3 December 2013, accepted 10 September 2014

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steromicroscope (LEICA MZ125). Illustrations of the new species were made with a camera lucida, and post-corrected with Adobe Illustrator® and Adobe Photoshop®.

The morphological terminology follows Karny (1923). All type specimens are deposited in the Shanghai Entomology Museum, Chinese Academy of Sciences.

3 Taxonomy

Phryganogryllacris Karny, 1937

Phryganogryllacris Karny, 1937. *Genera Ins.*, 206: 118. Type species: *Gryllacris phryganoides* De Haan, 1842.

Diagnosis. Small to medium sized. Head small, fastigium of vertex long-oval and smooth. Eyes long-ovate, prominent. Fore margin of pronotum more or less projected, hind margin straight. Tegmina and wings extending beyond the apex of abdomen. Base of M not united with R. Wings transparent, membranes pale. Fore coxae with spine, fore and mid tibiae with 5 pairs of spurs on ventral surface, mid tibiae bearing a spur on dorsal surface. Hind femora with spines ventrally, hind tibiae with 3–7 spines each margin on dorsal surface. Each side of male abdominal tergite 9 with a hook-like process, subgenital plate with styli. Ovipositor more or less upcurved, with slightly blunt apex.

Key to species of *Phryganogryllacris* from China

1. Pronotum without blackish macula or blackish band 2
Pronotum with blackish macula or blackish bands 6
2. Posterior margin of male subgenital plate without incision; ovipositor not extending beyond the apex of tegmina 3
Posterior margin of male subgenital plate with incision; ovipositor extending beyond the apex of tegmina 4
3. Abdominal tergite 9 of male broadly rounded; posterior margin of male subgenital plate broadly rounded; abdominal sternum 7 of female specialization; subgenital plate with a median incision *P. subrectis* (Matsumura & Shiraki, 1908)
Abdominal tergite 9 of male conical; posterior margin of male subgenital plate projected; abdominal sternum 7 of female not specialization; subgenital plate without median incision *P. brevixipha* (Brunner von Wattenwyl, 1893)
4. Tegmina rather extending beyond hind femora; cerci of male short (shorter than 5 mm); posterior margin of female subgenital plate with narrow incision 5
Tegmina hardly extending beyond hind femora; cerci of male long (longer than 5 mm); posterior margin of female subgenital plate with corniform incision *P. unicolor* Liu & Wang, 1998
5. Tegmina extending beyond 25 mm; abdominal tergite 9 of male lateral hook strongly curved
..... *P. sichuanensis* Li, Liu & Li, sp. nov.
Tegmina not extending beyond 25 mm; abdominal tergite 9 of male lateral hook straighter *P. sheni* Niu & Shi, 1999
6. Body small (tegmina not extending beyond 20 mm long) 7
Body larger (tegmina extending beyond 20 mm long) 8
7. Lateral margin of pronotum with blackish longitudinal band; posterior margin of female subgenital plate slightly concave
..... *P. parva* Li, Liu & Li, sp. nov.
Lateral and posterior margin of pronotum with black bands; posterior margin of female subgenital plate truncated
..... *P. truncata* Li, Liu & Li, sp. nov.
8. Hind femora with black stripes *P. decempunctata* Liu, Bi & Zhang, 2010
Hind femora without black stripe 9
9. Posterior margin of male subgenital plate broadly rounded; abdominal sternum 7 of female with deeply median incision
..... *P. mellii* (Karny, 1926)
Posterior margin of male subgenital plate with incision; abdominal sternum 7 of female normal 10
10. Tegmina transparent brownish yellow; cerci of male length 5–6 mm *P. xiai* Liu & Zhang, 2001
Tegmina semitransparent infusate; cerci of male length 8–9 mm 11
11. Disk of pronotum with interrupted blackish longitudinal band; both sides of sterna without blackish macula; abdominal tergite 9 with roundly convex posterior margin *P. interrupta* Li, Liu & Li, sp. nov.
Disk of pronotum with two pale blackish macula; both sides of sterna with blackish macula; abdominal tergite 9 with truncated posterior margin *P. longicerca* Li, Liu & Li, sp. nov.

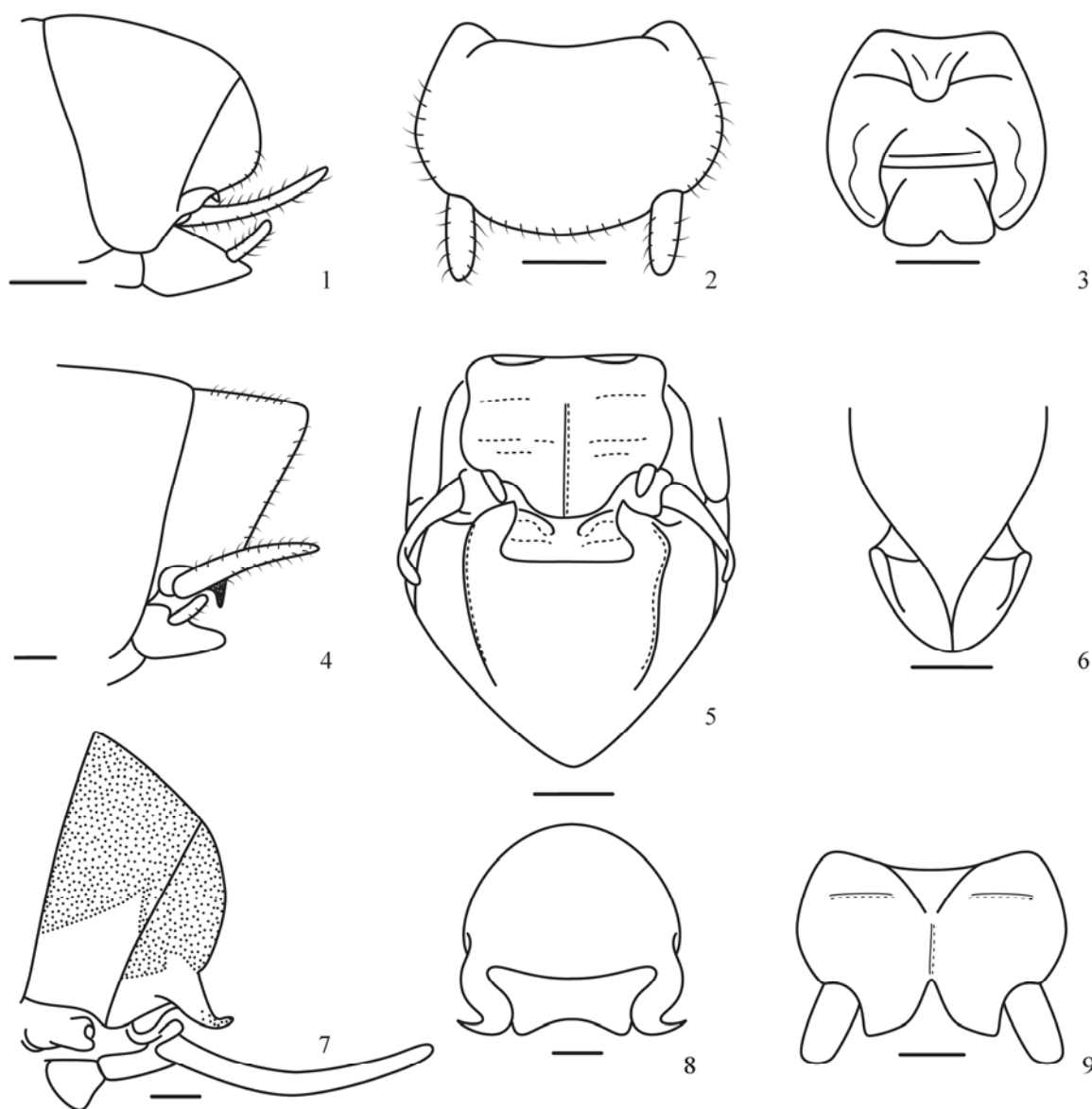
3.1 *Phryganogryllacris subrectis* (Matsumura & Shiraki, 1908) (Figs 1–3)

Gryllacris subrectis Matsumura & Shiraki, 1908. *Journ. Tohoku Univ. Sapporo*, 3: 71; Karny, 1929. *Nat. Hist. Mus. Wien*, 43: 82–83.

Gryllacris sp. Kato, 1932. Three colour illustrated insects of Japan, 1: 36, fig. 2.

Phryganogryllacris subrectis (Matsumura & Shiraki): Karny, 1937. *Genera Ins.*, 206: 120; Jin & Xia, 1994. *J. Orthopt. Res.*, 3: 17; Liu, 1999. In: Huang (ed.), *Fauna of Insects Fujian Province of China*, 1: 178; Ichikawa, 2001. *Tettigonia*, 3: 70.

Male. Body smaller than the others. Fastigium of vertex about 1.5 times as broad as scape. Pronotum uniform color, fore margin roundly projected, hind margin straight. Tegmina rather extending beyond the apex of abdomen, R with 3 branches, Rs occurred after the middle of R, with branches; basal section of M close to R; CuA with 3 branches, A with 3 or 4. Wings slightly longer than tegmina. Hind femora on ventral surface with 1–5 internal spines and 2–7 external spines; hind tibiae bearing 5–6 internal spines and 5–7 external spines on dorsal surface. Each side of abdominal tergite 9 with a



Figs 1–9. *Phryganogryllacris* spp. 1–3. *P. subrectis* (Matsumura & Shiraki, 1908). 1. End of abdomen, lateral view, ♂. 2. Subgenital plate, ventral view, ♂. 3. Subgenital plate, ventral view, ♀. 4–6. *P. brevixipha* (Brunner von Wattenwyl, 1893). 4. End of abdomen, lateral view, ♂. 5. End of abdomen, ventral view, ♂. 6. Subgenital plate, ventral view, ♀. 7–9. *P. sichuanensis* Li, Liu & Li, **sp. nov.** 7. End of abdomen, lateral view, ♂. 8. End of abdomen, caudal view, ♂. 9. Subgenital plate, ventral view, ♂. Scale bars=1 mm.

movable hook-like process. Cerci shorter; subgenital plate short and posterior margin rounded; styli short and conical (Fig. 2).

Female. Hind femora on ventral surface with 5–8 internal spines and 3–6 external spines; hind tibiae with 5–6 rows of internal spines and 6–8 rows of external spines dorsally. Abdominal sternum 7 specialization, with strongly elongated lateral corners. Subgenital plate with a median incision at posterior margin (Fig. 3). Ovipositor slightly exceeding hind femora, curved upwards.

Coloration. Body yellowish brown or yellowish green. Ocelli yellow.

Measurement. Body, ♂ 15.0–17.0 mm, ♀ 17.0–22.0 mm; pronotum, ♂ 4.0 mm, ♀ 4.0 mm; tegmina, ♂ 24.0–25.0 mm, ♀ 25.0–28.5 mm; hind femora, ♂ 11.0–12.0 mm, ♀ 12.0 mm; ovipositor, ♀ 12.0 mm.

Material examined. 1♂, 3♀, Hainan, Tonggulin, 25 April 2008, Qiang Fu leg.; 1♂, Hainan, Changjiang, Bawanglin, 22–24 September 2011, Xian-Wei Liu leg.

Distribution. Taiwan, Hainan.

3.2 *Phryganogryllacris brevixipha* (Brunner von Wattenwyl, 1893) (Figs 4–6)

Gryllacris brevixipha Brunner von Wattenwyl, 1893. *Ann. Mus. Civ. Stor. Nat. Genova*, 13(33): 190; Kirby, 1906. *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)*, 2: 146; Griffini, 1908. *Wiener Entomol.*, 27(6–7): 205; Griffini, 1915[1914]. *Bull. Soc. Entom.*, 46: 8.

Phryganogryllacris brevixipha (Brunner von Wattenwyl): Karny, 1937. *Genera Ins.*, 206: 119; Jin & Xia, 1994. *J. Orthopt. Res.*, 3: 17.

Male. Body small. Fastigium of vertex about 1.5 times as broad as scape. Fore margin of pronotum roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 3 branches, Rs occurred after the middle of R, with branches; basal section of M close to R; CuA with 3 branches, A with 3 or 4. Wings slightly long than tegmina. Hind femora on ventral surface with 1–5 internal spines and 2–7 external spines; hind tibiae with 5–6 rows of internal spines and 5–7 rows of external spines on dorsal surface. Abdominal tergite 9 triangular, each side with a hook-like process directed internally (Fig. 4). Cerci short, conical; subgenital plate with a median keel, posterior margin projected downwards; styli short (Fig. 5).

Female. Similar to male, but hind femora with 5–8 internal spines and 3–6 external spines ventrally; hind tibiae on dorsal surface with 5–6 rows of internal spines and 6–8 rows of external spines. Subgenital plate semicircular, lateral margins thickened, with a median keel (Fig. 6). Ovipositor as long as hind femora, slightly upcurved, with blunt apex.

Coloration. Body yellowish brown or yellowish green. Ocelli yellow.

Measurement. Body, ♂ 14.0–17.5 mm, ♀ 12.5–17.0 mm; pronotum, ♂ 3.0–4.0 mm, ♀ 3.5–4.0 mm; tegmina, ♂ 18.5–23.0 mm, ♀ 21.0–23.5 mm; hind femora, ♂ 9.0–12.0 mm, ♀ 10.0–12.0 mm; ovipositor, ♀ 10.5–12.0 mm.

Material examined. 1♂, Guangxi, Neicu River, 26 July 1979, collector unknown; 1♂, Guangxi, Yanshan, 18 June 1982, Fa-Sheng Li (China Agricultural University) leg.; 1♂, Guangxi, Yuanbao Mountain (elev. 800 m), 25 September 1992, Tian-Shan Li leg.; 1♀, Fujian, Wuyi Mountain, Sangang, 27 August–3 September 1994, Xing-Bao Jin and Hai-Sheng Yin legs.; 1♂, 2♀, Guangxi, Fanjing Mountain, 29 July–3 August 2001, Fu-Ming Shi leg.; 3♂, 1♀, Hunan, Badagong Mountain, 13 August 2001, Fu-Ming Shi leg.

Distribution. Fujian, Hunan, Guizhou, Guangxi.

3.3 *Phryganogryllacris sichuanensis* Li, Liu & Li, sp. nov. (Figs 7–9)

Male. Size typical of this genus, stout. Fastigium of vertex about 2 times as broad as scape. Fore margin of pronotum slightly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, M independent, furcated at base; CuA with 2 branches, between the first and the second branches with an oblique connecting with the M, A with 4 branches, the last of them united at base. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 3–9 internal spines and 2–6 external spines; hind tibiae on dorsal surface with 4–6 internal spines and 5–6 external spines. Abdominal tergite 9 broadly rounded, each side with a hook-like process, slightly S-curved (Figs 7–8). Cerci short, about 4.5 mm long, conical; posterior margin of subgenital plate with a deeply incision (Fig. 9), apex of lobes somewhat obliquely truncate; styli rather flattened.

Female. Unknown.

Coloration. Body yellowish brown. Eyes blackish brown. All legs slightly pale red, spines and spurs of fore and mid tibiae distinctly blacken. Venation of tegmina in apical region slightly dark. Dorsal surface of abdomen darkish black,

ventral and lateral surface yellowish brown.

Measurement. Body, ♂ 18.0–23.5 mm; pronotum, ♂ 4.0–5.5 mm; tegmina, ♂ 25.0–31.0 mm; hind femora, ♂ 13.0–15.0 mm.

Material examined. Holotype ♂, Sichuan, Dujiangyan, Qingcheng Mountain (elev. 750–850 m), 27 June 1987, Xiu-Jiang Zhang leg. Paratypes: 1♂, Sichuan, Yaan, Zhougong Mountain, 13–21 July 1939, Yao Zhou etc. legs.; 2♂, Sichuan, Tianquan, Laba River (elev. 2060 m), 28–30 July 2007, Xian-Wei Liu etc. legs.; 1♂, Yunnan, Lushui, Pianma (elev. 2300 m), 6–7 July 2010, Wen-Xuan Bi leg.

Distribution. Sichuan, Yunnan.

Remarks. This new species is closely related to *Phryganogryllacris sheni* Niu & Shi, 1999, but differs from it by tegmina and cerci rather longer, the hook-like processes of male abdominal tergite 9 slightly S-curved.

3.4 *Phryganogryllacris sheni* Niu & Shi, 1999 (Figs 10–12)

Phryganogryllacris sheni Niu & Shi, 1999. The Fauna and Taxonomy of Insects in Henan, 4: 14–15.

Male. Body medium sized, stout. Fastigium of vertex about 1.5 times as broad as scape. Fore margin of pronotum roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 5 branches, Rs occurred after the middle of R, with 2 branches or without branch; CuA simple, with a short oblique connecting with M; A with 4, the third and fourth branches connecting at base. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 4–7 internal spines and 3–5 external spines; hind tibiae on dorsal surface with 5 internal spines and 5–7 external spines. The hook-like processes of abdominal tergite 9 almost straight. Cerci shorter, 3 mm long (Fig. 10); lateral margin of subgenital plate rounded, posterior margin split into two lobes; styli stout, slightly flattened (Fig. 11).

Female. Tegmina slightly short, extending beyond hind femora. Hind femora on ventral surface with 7–8 internal spines and 6–7 external spines; hind tibiae on dorsal surface with 5–6 internal spines and 6–7 external spines. Subgenital plate roundly truncate (Fig. 12). Ovipositor slightly longer than hind femora, slightly upcurved.

Coloration. Body yellowish brown. Ocelli yellow, eyes brown. Venation of tegmina with blackish brown, apex of abdomen and spines of all legs black.

Measurement. Body, ♂ 16.5–18.5 mm, ♀ 18.0 mm; pronotum, ♂ 3.7–4.5 mm, ♀ 4.4 mm; tegmina, ♂ 22.6–24.0 mm, ♀ 19.5 mm; hind femora, ♂ 10.6–12.0 mm, ♀ 11.5 mm; ovipositor, ♀ 13.5 mm.

Material examined. 1♀, Shaanxi, Taibai, Zhongshanshi (elev. 1430 m), 23 July 1956, Yao Zhou leg.; 2♂, Shaanxi, Taibai-shan, Shangbaiyun (elev. 1740 m), 23–25 July 1956, Yao Zhou leg.; 3♂, Shaanxi, Longxian, 6 August 1980, Ge-Xiang Wang leg.; 1♀, Shaanxi, Qinling Station, 1 October 1980, Yao Zhou etc. legs.; 1♂, Shaanxi, Longcaoping, 9 August 1981, collector unknown; 1♂, Shaanxi, Heyang, 1 October 1981, collector unknown; 1♀, Shaanxi, Huaxian, 19 October 1981, collector unknown; 1♀, Shaanxi, Taibaishan, Dadian, 16 July 1982, Hong-Mou Wei leg.; 1♂, Shaanxi, Taibai, Zhongshanshi, 17 July 1982, Jing-Ruo Zhou and Lan Liu legs.; 3♂, Shaanxi, Taibaishan, Songpingshi (elev. 1200 m), 14–26 July 1982, collector unknown; 2♂, Shaanxi, Taibaishan, Songpingshi, 15 August 1983, collector unknown; 3♂, Shaanxi, Huxian, Hualinping (elev. 1700 m), 28 June 2007, Shun Zhou leg.

Distribution. Henan, Sichuan, Gansu.

3.5 *Phryganogryllacris unicolor* Liu & Wang, 1998 (Figs 13–15)

Phryganogryllacris unicolor Liu & Wang, 1998. *Henan Science*, 16(1): 70; Liu & Zhang, 2005. In: Yang (ed.), *Insect Fauna of Middle-West Qinling Range and South Mountains of Gansu Province*: 93.

Male. Body size average for the genus, stout. Fastigium of vertex about 1.5 times as broad as scape. Fore margin of pronotum slightly roundly projected, hind margin straight. Tegmina rather extending beyond the apex of abdomen; R with 5 branches, Rs occurred after the middle of R, with branches, CuA simple; A with 4, the last of them united at base. Wings slightly long than tegmina. Hind femora with 3–11 internal spines and external spines on ventral surface; hind tibiae with 4–5 internal spines and 5–6 external spines on dorsal surface. Each side of abdominal tergite 9 with a hook-like process directed internally (Fig. 13). Cerci rather long, 7 mm long; lateral margin of subgenital plate rounded, posterior margin with incision, lateral lobe rounded (Fig. 14); styli shorter, slightly flattened.

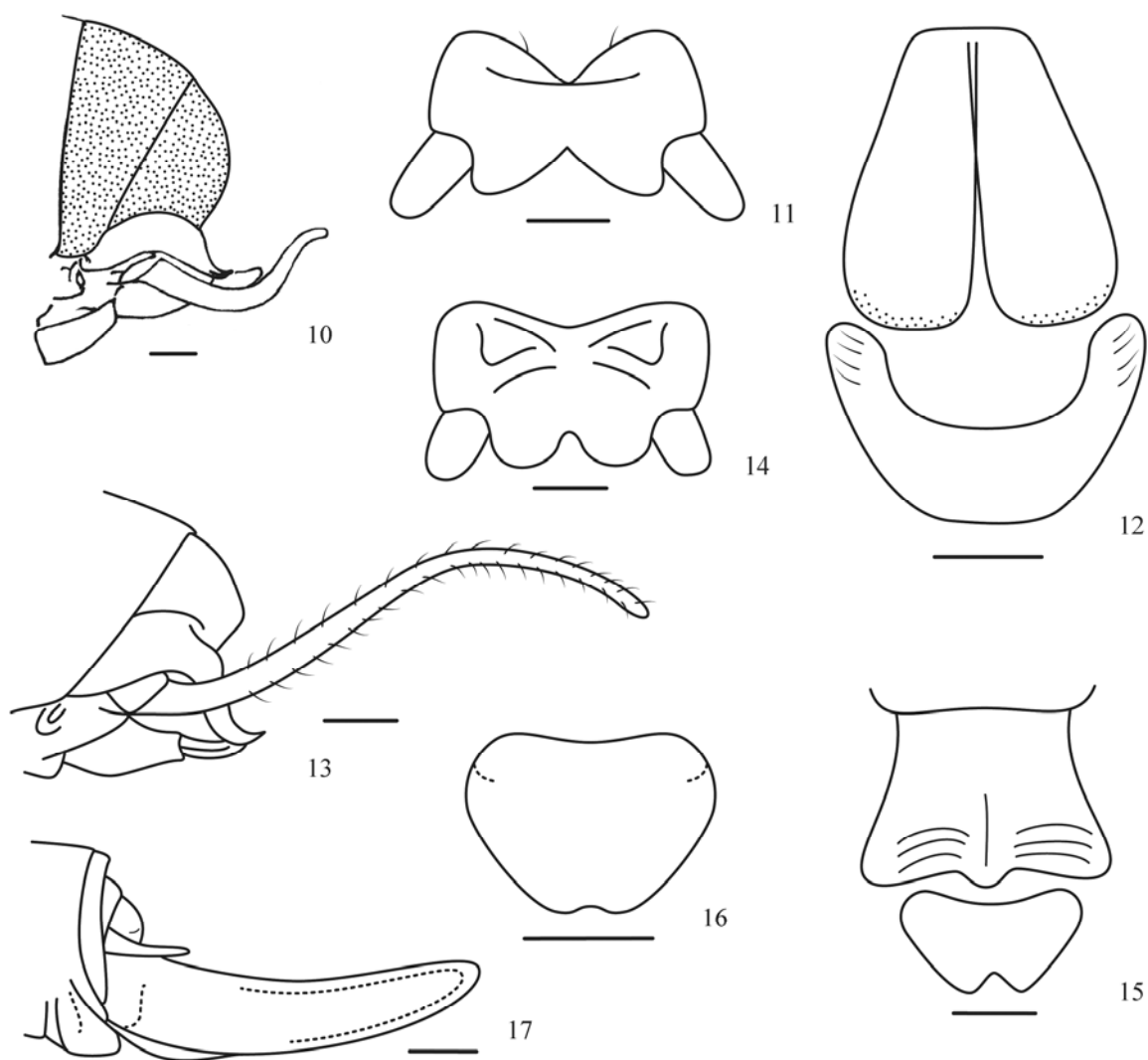
Female. Hind femora on ventral surface with 4–9 internal spines and external spines; hind tibiae on dorsal surface with 5–6 internal spines and external spines. Subgenital plate almost triangularly, apex with corniform incision (Fig. 15). Ovipositor slightly longer than hind femora, almost straight.

Coloration. Body yellowish brown. Ocelli yellow, eyes, apex of abdomen, spines of hind legs darkish black.

Measurement. Body, ♂ 15.0–23.0 mm, ♀ 18.0–28.0 mm; pronotum, ♂, ♀ 4.5–5.0 mm; tegmina, ♂ 14.0–25.0 mm, ♀ 16.0–22.0 mm; hind femora, ♂ 10.0–12.5 mm, ♀ 11.0–13.0 mm; ovipositor, ♀ 12.5–15.0 mm.

Material examined. 1♂, Beijing, Sanbao, July 1976, Jian-Ming Zhao leg.; 2♀, Henan, Luoshandongzhai, 23–24 June 1994, Yao Niu leg.; 1♂, Henan, Songxian, Baiyunshan, 9–20 July 1996, Zu-Yao Liu etc. legs.; 1♀, Henan, Denfeng, Songshan (elev. 900 m), collector unknown; 2♂, Henan, Luanchuan, Longyuwan, 10–13 July 1996, Zu-Yao Liu etc. legs.; 1♂, Henan, Songxian, Baiyunshan, 8 September 2000, Zu-Yao Liu and Wei-Nian Zhang leg.; 3♂, Henan, Tongbai Mountain, 11 September 2000, Xian-Wei Liu and Wei-Nian Zhang leg.; 3♀, Hebei, Xinglongxian, Wuling Mountain (elev. 600 m), 8–9 September 2007, Xian-Wei Liu etc. legs.

Distribution. Beijing, Henan, Hebei.



Figs 10–17. *Phryganogryllacris* spp. 10–12. *P. sheni* Niu & Shi, 1999. 10. End of abdomen, lateral view, ♂. 11. Subgenital plate, ventral view, ♂. 12. Subgenital plate, ventral view, ♀. 13–15. *P. unicolor* Liu & Wang, 1998. 13. End of abdomen, lateral view, ♂. 14. Subgenital plate, ventral view, ♂. 15. Subgenital plate, ventral view, ♀. 16–17. *P. parva* Li, Liu & Li, **sp. nov.** 16. Subgenital plate, ventral view, ♀. 17. End of abdomen, lateral view, ♀. Scale bars=1 mm.

3.6 *Phryganogryllacris parva* Li, Liu & Li, sp. nov. (Figs 16–17)

Female. Body small. Fastigium of vertex rounded, about 2 times as wide as scape; eyes ovoid, prominent; Ocelli 3. Tegmina slightly extending beyond the apex of hind femora, R bifurcate near apex; Rs occurred after the middle of R, with 2 branches; M simple, its basal section close to R; CuA occurred behind the middle. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 2 internal spines and 5–6 external spines; hind tibiae on dorsal surface with 5 internal spines and external spines. Subgenital plate semicircular, posterior margin slightly concave (Fig. 16). Ovipositor broad and short, with somewhat blunt apex (Fig. 17).

Male. Unknown.

Coloration. Body pale yellowish brown. Eyes blackish brown, ocelli yellow, lateral and hind margin of pronotum dark, ventral of pronotum with darkish brown longitudinal bands on two sides; venation of tegmina, spines of hind legs slightly with dark, ventral and dorsal of abdomen blackish brown.

Measurement. Body, ♀ 17.5 mm; pronotum, ♀ 3.5 mm; tegmina, ♀ 15.0 mm; hind femora, ♀ 9.0 mm; ovipositor, ♀ 7.0 mm.

Material examined. Holotype ♀, Guizhou, Fanjing Mountain, 1 August 2001, Fu-Ming Shi leg.

Distribution. Guizhou.

Etymology. The species is named refer to the body small.

Remarks. This new species is very similar to *P. gialai* (Gorochoy, 2004) **comb. nov.** and *P. alia* (Gorochoy, 2004) **comb. nov.** from Vietnam, but differs from the latter by the stripes of pronotum and shape of subgenital plate.

3.7 *Phryganogryllacris truncata* Li, Liu & Li, sp. nov. (Figs 18–19)

Female. Body small. Head slightly wider than pronotum; fastigium of vertex broadly rounded, about 2 times as wide as scape; eyes ovoid, prominent; ocelli 3, middle ocellus rounded. Fore margin of pronotum slightly projected, hind margin straight, later lobes lower, with pale sulcus. Tegmina slightly extending beyond the apex of hind femora, R bifurcate near apex; Rs occurred from the middle of R, with 3 branches, M simple, its basal section close to R; CuA occurred behind the middle. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 2 internal spines and 4–5 external spines; hind tibiae on dorsal surface with 3–4 internal spines and 6 external spines. Cerci short, conical; subgenital plate with truncate apex (Fig. 18). Ovipositor more broad and short, with blunt apex (Fig. 19).

Male. Abdominal tergite 9 rounded concave, each side of basal margin with a hook-like process. Cerci shorter, conical; hind margin of subgenital plate deeply split into two lobes, apex of lobes somewhat obliquely truncate; styli rather flattened.

Coloration. Body pale yellowish. Eyes, lateral and hind margin of pronotum, venation of tegmina and dorsal surface of abdomen blackish.

Measurement. Body, ♂ 21.0 mm, ♀ 17.0 mm; pronotum, ♂ 3.8 mm, ♀ 4.0 mm; tegmina, ♂ 19.0 mm, ♀ 18.0 mm; hind femora, ♂ 9.0 mm, ♀ 10.5 mm; ovipositor, ♀ 7.5 mm.

Material examined. Holotype ♀, Guizhou, Leigong Mountain, 30 June 1985, Zu-Yao Liu leg. Paratype 1 ♂ (Institute of Zoology, Chinese Academy of Sciences), Guizhou, Leigong Mountain (elev. 1 500–1 700 m), 1 July 1988, Da-Yong Xue leg.

Distribution. Guizhou.

Etymology. The species is named refer to the subgenital plate of female.

Remarks. This new species is very similar to *Phryganogryllacris parva* Li, Liu & Li, **sp. nov.**, but differs from the latter by hind margin of pronotum with darkish black bands, subgenital plate of female truncate and ovipositor shorter.

3.8 *Phryganogryllacris decempunctata* Liu, Bi & Zhang, 2010 (Figs 20–24)

Phryganogryllacris decempunctata Liu, Bi & Zhang, 2010. In: Xu (ed.), Insects of Fengyangshan National Nature Reserve: 60, figs 5a–d.

Male. Body medium sized. Fastigium of vertex about 2 times as broad as scape; eyes long-ovate, prominent. Fore margin of pronotum slightly roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 4 branches, Rs occurred after the middle of R, with 5 branches; M simple, its basal section united with R, CuA with 3 branches, between the first and the second branches with an oblique connecting with the M, A with 4, the last

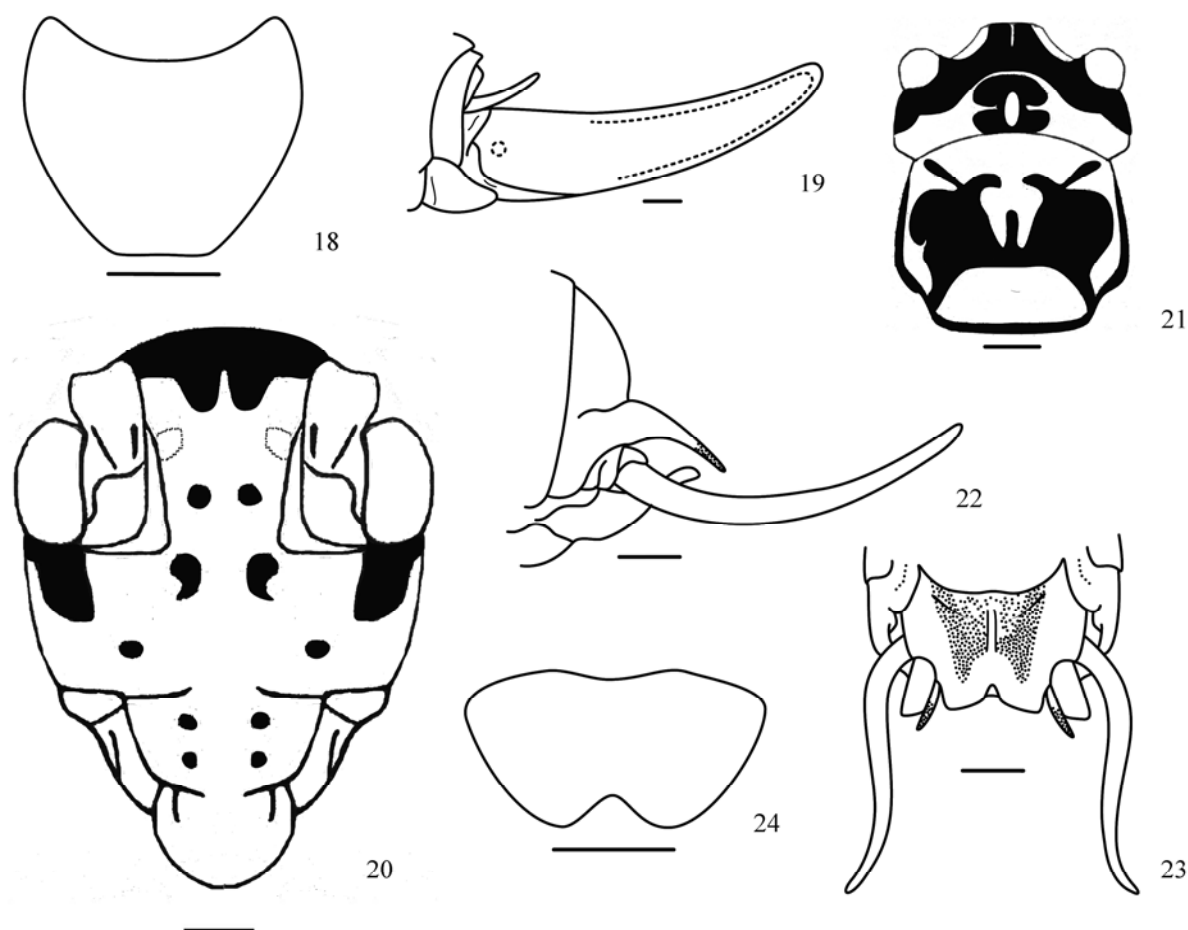
of them united at base. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 2–4 external spines and 4–5 internal spines; hind tibiae on dorsal surface with 6–7 rows of external spines and 7 rows of internal spines. 9th abdominal tergite roundly convex, each side with a hook-like process directed internally. Cerci rather long; posterior margin of subgenital plate deeply split into two rounded lobes; styli short and slightly flattened (Figs 22–23).

Female. R of tegmina with 4 branches, Rs occurred from the middle of R, not bifurcate. Subgenital plate semicircular, posterior margin with a broad incision (Fig. 24). Ovipositor longer than hind femora, straight, with slightly sharp apex.

Coloration. Body pale yellowish brown. Occiput blackish brown, with a rounded pale broadly macula behind head, eyes blackish brown, with darkish longitudinal stripes behind them, ocelli yellow; face with 10 paired blackish spots (Fig. 20); the black stripes of pronotum looks like butterfly (Fig. 21). Venation brownish yellow, but venation of male more pale. Basal section of all tibiae with a darkish brown transversal band, ventral and lateral of fore and mid femora darkish black, each sides with a darkish black spots or short stripe; apex of hind femora almost darkish black on ventral and lateral surface, basal half with rows of darkish black spots. Spurs of fore and mid legs, spines of hind legs darkish black. Each side of abdominal tergites darkish brown; basal half of female abdominal tergite darkish brown.

Measurement. Body, ♂ 18.5 mm, ♀ 19.0 mm; pronotum, ♂ 4.0 mm, ♀ 4.5 mm; tegmina, ♂ 24.0 mm, ♀ 24.5 mm; hind femora, ♂ 11.5 mm, ♀ 12.0 mm; ovipositor, ♀ 16.0 mm.

Material examined. 1♂, 1♀, Zhejiang, Qingyuan, Baishanzu, 12–28 July 1996, Xin-Bao Jin and Wei-Nian Zhang legs.; 1♂, Zhejiang, Qingyuan, Baishanzu (elev. 1000 m), 26–30 June 2005, Wen-Xuan Bi leg.; 1♂, Zhejiang, Qingyuan,



Figs 18–24. *Phryganogryllacris* spp. 18–19. *P. truncata* Li, Liu & Li, **sp. nov.** 18. Subgenital plate, ventral view, ♀. 19. End of abdomen, lateral view, ♀. 20–24. *P. decempunctata* Liu, Bi & Zhang, 2010. 20. Head, frontal view. 21. Head and pronotum, dorsal view. 22. End of abdomen, lateral view, ♂. 23. End of abdomen, ventral view, ♂. 24. Subgenital plate, ventral view, ♀. Scale bars= 1 mm.

Baishanzu (elev. 1 100 m), 2–5 September 2006, Xian-Wei Liu leg.; 1♀, Zhejiang, Qingyuan, Baishanzu (elev. 1 000 m), 20–23 July 2007, Zhi-Zhou Xu leg.; 1♂, 1♀, Zhejiang, Longquan, Fengyang Mountain (elev. 1 400 m), 27 July 2007, Qiang Fu leg.; 1♀, Fujian, Wuyi Mountain, Tongmu (elev. 600 m), 10–12 July 2010, Xian-Wei Liu leg.

Distribution. Zhejiang, Fujian.

3.9 *Phryganogryllacris mellii* (Karny, 1926) (Figs 25–29)

Gryllacris mellii Karny, 1926. *Mitt. Zool. Mus. Berlin*, 12: 368.

Phryganogryllacris mellii (Karny): Karny, 1937. *Genera Ins.*, 206: 119; Liu, 1993. In: Huang, C-M (ed.), *Animal in Longqi Mountain*: 41; Liu, 1993. *Contr. Shanghai Inst. Ent.*, 11: 110; Jin & Xia, 1994. *J. Orthopt. Res.*, 3: 17; Liu, 1999. In: Huang (ed.), *Fauna of Insects Fujian Province of China*, 1: 178.

Male. Body medium. Fastigium of vertex about 1.5 times as broad as scape. Fore margin of pronotum slightly roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 5 branches, Rs occurred from the middle of R, with 4 branches, M absolutely independent, its basal section united with R; CuA with 3 branches, the fore branch of first and second branches connected with the M, A with 4, the last of them united at base. Wings slightly longer than tegmina. Hind femora with 5 internal spines and 3 external spines ventrally; hind tibiae with 6 internal spines and 6–7 external spines on dorsal surface. Abdominal tergite 9 rather short, roundly convex, each side of lateral plate with a hook-like process directed externally. Cerci rather long, incurved. Subgenital plate broad, posterior margin broadly round, styli conical (Fig. 28).

Female. Abdominal sternum 7 with deeply middle concave, posterior-lateral corners strong elongated (Fig. 29). Subgenital plate semicircular, posterior margin with incision; ovipositor almost as long as hind femora, slightly upcurved, with slightly blunt apex.

Coloration. Body pale yellowish brown. Ocelli pale yellow, occiput, eyes, pronotum and apex of abdomen with blackish brown stripes (Figs 25–26).

Measurement. Body, ♂ 18.0 mm, ♀ 20.5–22.5 mm; pronotum, ♂ 3.6–5.0 mm, ♀ 3.8–4.2 mm; tegmina, ♂ 29.0–30.0 mm, ♀ 27.0–31.5 mm; hind femora, ♂ 10.5–12.0 mm, ♀ 10.5–13.0 mm; ovipositor, ♀ 11.5–13.0 mm.

Material examined. 1♂, Hunan, Dayong, Zhushitoulinchang, 13 June 1988, Zu-Yao Liu leg.; 1♀, Guangdong, Nanling Nature Reserve (elev. 1 000 m), 20 June 2007, Hao Huang leg.; 1♂, Guangdong, Nanling Nature Reserve (elev. 1 000 m), 6 July 2008, Bao-Ping Huang and Ying Yan legs.; 2♂, 5♀, Zhejiang, Kaihua, Gutian Mountain, 18–20 June 2013, Xian-Wei Liu and Hai-Guang Zhang legs.; 1♀ (China Agricultural University), Guangxi, Wuming, Daming Mountain, 24 May 1963, Ji-Kun Yang leg.; 1♂ (China Agricultural University), Hunan, Nanyue, Mojingtai, 22 June 1963, Ji-Kun Yang leg.

Distribution. Hunan, Guangdong, Guangxi, Zhejiang.

3.10 *Phryganogryllacris xiai* Liu & Zhang, 2001 (Figs 30–35)

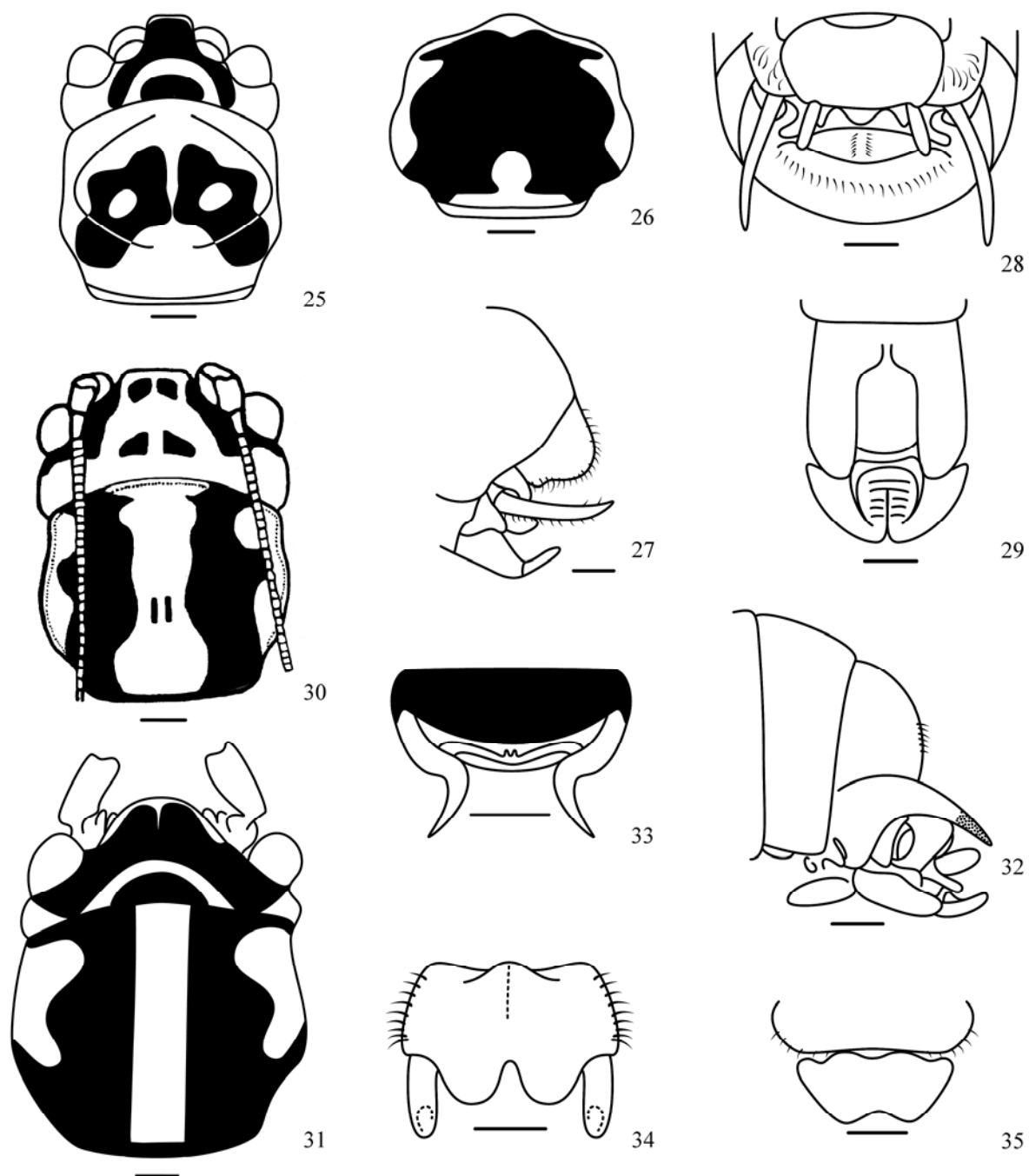
Phryganogryllacris xiai Liu & Zhang, 2001. In: Wu & Pan (eds.), *Insect of Tianmushan National Nature Reserve*: 99.

Male. Body medium. Fastigium of vertex about 2 times as broad as scape. Eyes long-ovate, prominent. Fore margin of pronotum slightly roundly projected, hind margin straight; lateral plate lower. Tegmina rather extending beyond the apex of hind femora, M simple; CuA with 3 branches, between the first and the second branches with a short oblique connecting with M, A with 4, the last of them united at base. Wings slightly extending beyond tegmen. Mid tibiae on dorsal surface with spurs. Hind femora on ventral surface with 4–6 external spines and 6–7 internal spines; hind tibiae on dorsal surface with 5–6 external spines and 3–5 internal spines. 9th abdominal tergite roundly convex, each side with a hook-like process (Figs 32–33). Cerci rather long, conical; posterior margin of subgenital plate deeply split into two rounded lobes; styli short and slightly flattened (Fig. 34).

Female. Subgenital plate transverse, with concave posterior margin (Fig. 35). Ovipositor slightly longer than hind femora, slightly upcurved, apex slightly sharp.

Coloration. Body pale yellowish brown. Occiput blackish brown, behind it with a rounded pale transverse macula (Figs 30–31), eyes blackish brown. Pronotum with two wide black longitudinal bands. Tegmina transparent brownish yellow. Spines of hind legs, apex of male abdomen darkish black.

Measurement. Body, ♂ 21.0 mm, ♀ 21.0–27.0 mm; pronotum, ♂ 4.8–5.2 mm, ♀ 4.0–5.0 mm; tegmina, ♂ 27.0–28.0 mm, ♀ 28.0–34.0 mm; hind femora, ♂ 13.0–14.5 mm, ♀ 12.0–14.5 mm; ovipositor, ♀ 19.0 mm.



Figs 25–35. *Phryganogryllacris* spp. 25–29. *P. mellii* (Karny, 1926). 25. Head and pronotum, dorsal view, ♂. 26. Pronotum, dorsal view, ♀. 27. End of abdomen, lateral view, ♂. 28. End of abdomen, ventral view, ♂. 29. Subgenital plate, ventral view, ♀. 30–35. *P. xiai* Liu & Zhang, 2001. 30. Head and pronotum, dorsal view, ♂. 31. Head and pronotum, dorsal view, ♀. 32. End of abdomen, lateral view, ♂. 33. End of abdomen, dorsal view, ♂. 34. Subgenital plate, ventral view, ♂. 35. Subgenital plate, ventral view, ♀. Scale bars=1 mm.

Material examined. 1♀, 1♂, Zhejiang, Tianmu Mountain, 19 August 1987, Jian-Zhong Zhou and Shu-De Fan leg.; 1♀, Zhejiang, Tianmu Mountain (elev. 350 m), 29 June 2007, Wen-Xuan Bi leg.; 1♂, Zhejiang, Tianmu Mountain (elev. 700 m), 9 June 2009, Wen-Xuan Bi leg.

Distribution. Zhejiang.

3.11 *Phryganogryllacris interrupta* Li, Liu & Li, sp. nov. (Figs 36–38)

Male. Body medium sized, stout. Fastigium of vertex about 1.5 times as wide as scape. Fore margin of pronotum roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 3 branches, Rs occurred from 1/3 of R, furcated, M independent, its basal section close to R; CuA with 3 branches, the fore branch of first branch united with M, A with 4, the last of them united at base. Wings slightly longer than tegmina. Hind femora on ventral surface with 9–10 internal spines and 8 external spines; hind tibiae with 6 internal spines and 7 external spines on dorsal surface. Abdominal tergite 9 rather short, posterior margin roundly convex, each sides with a hook-like process. Cerci rather long (Fig. 37); posterior margin of subgenital plate split into two rounded lobes; styli short and slightly flattened (Fig. 38).

Female. Unknown.

Coloration. Body yellowish brown. Occiput pale, only with black longitudinal stripes behind eyes (Fig. 36); eyes blackish brown. Pronotum pale yellowish brown, with black margin, the disk with blackish brown interrupt longitudinal stripes. Tegmina semitransparent infusate, venation of apical region darken. Spines and spurs of all legs, basal half of all abdominal tergites, abdominal tergites 8–9 darkish black.

Measurement. Body, ♂ 22.0 mm; pronotum, ♂ 5.0 mm; tegmina, ♂ 28.0 mm; hind femora, ♂ 15.0 mm.

Material examined. Holotype ♂, Guangxi, Longsheng, Huaping, 30 August 1962, collector unknown.

Distribution. Guangxi.

Etymology. The species is named refer to the pattern of pronotum.

Remarks. This new species is similar to *Phryganogryllacris xiai* Liu & Zhang, 2001, but distinguished by interrupted blackish longitudinal bands on the pronotum, tegmina semitransparent infusate and cerci of male longer.

3.12 *Phryganogryllacris longicerca* Li, Liu & Li, sp. nov. (Figs 39–41)

Male. Body medium. Fastigium of vertex about 1.5 times as wide as scape. Ocelli inconspicuous. Fore margin of pronotum slightly roundly projected, hind margin straight. Tegmina rather extending beyond the apex of hind femora, R with 3 branches, Rs occurred from 1/3 of R, furcated, M independent, its basal section close to R; CuA with 3 branches, the fore branch of first and second branches united with the M, A with 4, the last of them united at base. Wings slightly extending beyond tegmen. Hind femora on ventral surface with 6–7 internal spines and external spines; hind tibiae on dorsal surface with 6 internal spines and external spines. 9th abdominal tergite rather short, posterior margin truncate, each side with a long hook-like process directed externally. Cerci rather long, almost 9 mm long (Fig. 40); posterior margin of subgenital plate deeply split into two rounded lobes; styli short and slightly flattened (Fig. 41).

Female. Unknown.

Coloration. Body yellowish brown, occiput blackish brown, with pale cruciate macula (Fig. 39); eyes blackish brown. Pronotum yellowish brown, with blackish margins, the disk blackish brown with two pale macula, later lobes yellowish brown. Venation slightly darken. Spines and spurs of all legs, every abdominal tergites, both sides of sterna of 8th abdominal tergites darkish black.

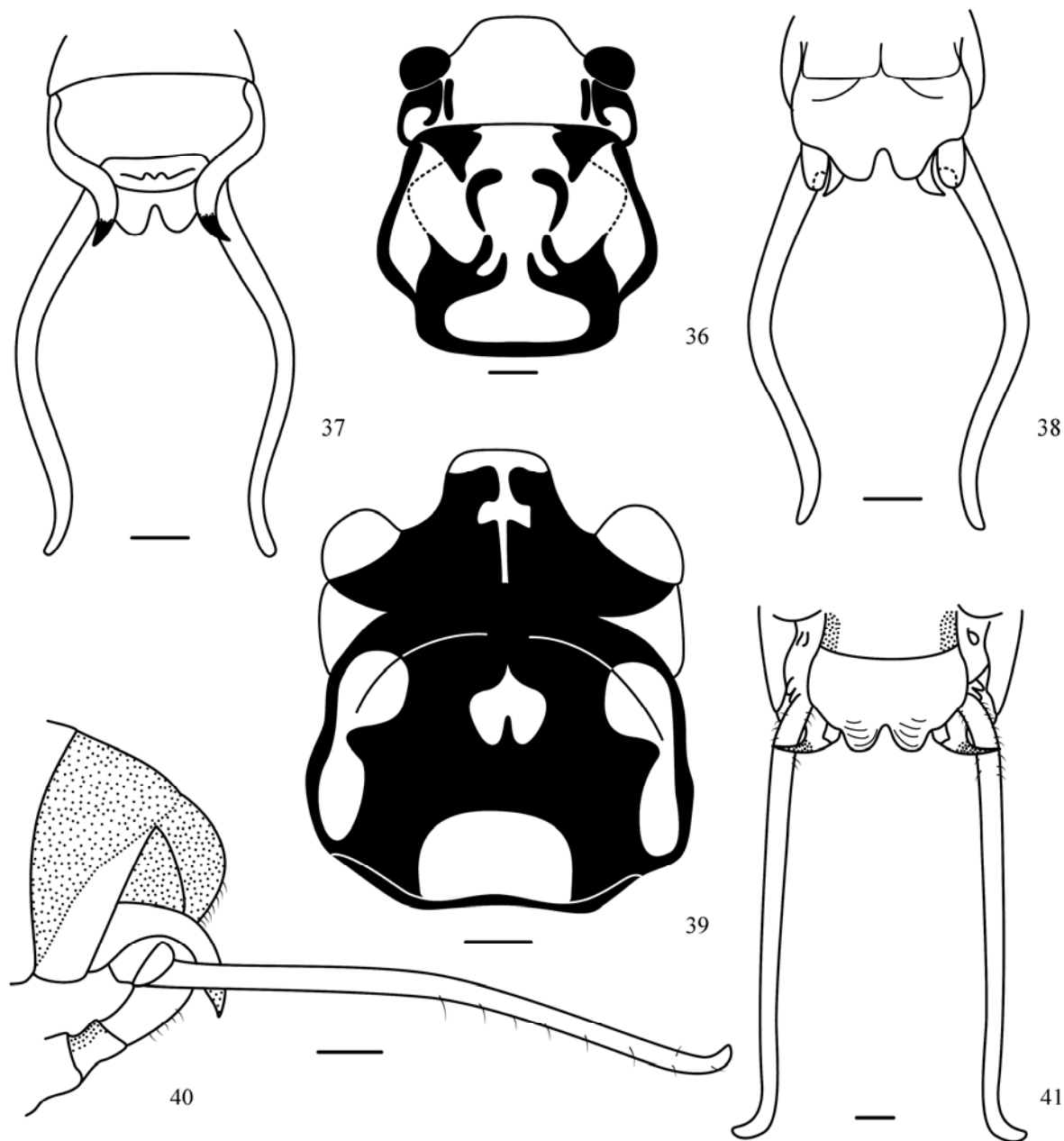
Measurement. Body, ♂ 22.0 mm; pronotum, ♂ 5.0 mm; tegmina, ♂ 28.0 mm; hind femora, ♂ 15.0 mm.

Material examined. Holotype ♂, Guangxi, Xing'an, Maoer Mountain, 10 August 2009, Ying Yan and Bao-Ping Huang legs.

Distribution. Guangxi.

Etymology. The species is named refer to the very long cerci of male.

Remarks. This new species is very similar to *Phryganogryllacris interrupta*, but differs from it by the head and pronotum blackish pattern and abdominal tergite 9 of male with almost truncated posterior margin.



Figs 36–41. *Phryganogryllacris* spp. 36–38. *P. interrupta* Li, Liu & Li, **sp. nov.** 36. Head and pronotum of male, dorsal view, ♂. 37. End of male abdomen, dorsal view, ♂. 38. End of male abdomen, ventral view, ♂. 39–41. *P. longicerca* Li, Liu & Li, **sp. nov.** 39. Head and pronotum of male, dorsal view, ♂. 40. End of male abdomen, lateral view, ♂. 41. End of male abdomen, ventral view, ♂. Scale bars=1 mm.

Funding This research was supported by the Natural Science Foundation of Shanghai, China (14ZR1413000), the Scientific Research Innovation Foundation of East China Normal University (78210268), the Science-technology Basic Condition Platform from the Ministry of Science and Technology of the People's Republic of China (2005DKA21402) and Informationization Project of CAS-Integration of Scientific Databases in Zoological Science (XXH12504-1-03).

Acknowledgements We thank Chun-Xiang Liu (Institute of Zoology, Chinese Academy of Sciences) and Li Dai (Shanghai Entomology Museum, Chinese Academy of Sciences, Shanghai) for their help on the manuscript. We are grateful to all collectors in this paper.

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